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FINE-TUNING DEVICE AND METHOD FOR TUNING TELEVISION DATA

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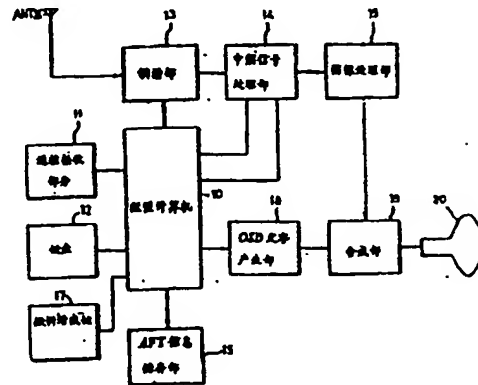
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Abstract

The present invention provides a fine-tuning device and method for tuning television data so that even in abnormal situations, such as when receiving a detuned broadcasting signal or broadcasting signal in strong or weak electric fields, the tuning data can be finely tuned quickly via a manual system and an automatic system without a flickering picture.

The device of the present invention includes a memory unit for storing the AFT information of the detuning frequency on the basis of center frequency and a microcomputer, which can calculate the tuning data from the center frequency of a selected channel and the read AFT information after appropriate AFT information is read out. This device may also have fine-tuning up/down keys.



- Key:
- 10 Microcomputer
  - 11 Remote control receiving unit
  - 12 Keypad
  - 13 Tuning unit
  - 14 Intermediate frequency signal processing unit
  - 15 Image processing unit
  - 15 [sic] AFT information storage unit
  - 17 Fine-tuning up/down keys
  - 18 OSD character generator
  - 19 Synthesizer

### Claims

1. A fine-tuning device for tuning television data characterized by the following structure:

a microcomputer that provides the tuning data for controlling the tuning of the broadcasting signals of a selected channel;

a tuner that tunes the broadcasting signals of the selected channel from the broadcasting signals received by an antenna on the basis of aforementioned tuning data provided by the aforementioned microcomputer;

an intermediate frequency signal processor that performs intermediate frequency processing of the broadcasting signals of the channel selected and output from the aforementioned tuner to detect the synchronizing signal and automatic fine-tuning (AFT) signal

from the aforementioned broadcasting signals and supplies them to the intermediate frequency signal processor of the aforementioned microcomputer;

an AFT information storage mechanism for storing the AFT information of the detuning frequency of the broadcasting signals of each received channel according to the control of the aforementioned microcomputer; and

fine-tuning up/down keys that have data connection with the aforementioned microcomputer and are used manually to increase/decrease the aforementioned tuning data supplied to the aforementioned tuner from the aforementioned microcomputer; wherein, when the aforementioned microcomputer changes channels, it calculates tuning data from the center frequency data of the selected channel and the aforementioned AFT information data stored in aforementioned AFT information storage mechanism and increases/decreases the aforementioned tuning data depending on the input of the aforementioned fine-tuning up/down keys, and finally outputs the tuning data.

2. The fine-tuning device for tuning television data described in Claim 1 characterized by the fact that the aforementioned AFT information storage mechanism has the following structure:

a serial/parallel shift register that converts the aforementioned address signal and AFT information signal output in series from the aforementioned microcomputer into parallel output;

a register that stores the aforementioned AFT information signal at the address designated according to the address signal output from the aforementioned serial/parallel shift register according to the write enable signal output from the aforementioned microcomputer and outputs the stored AFT information signal according to a read enable signal; and

a buffer register that temporarily stores the aforementioned AFT information signal output from the aforementioned register and then sends it to the aforementioned microcomputer.

3. The fine-tuning device for tuning television data described in Claim 1 characterized by the fact that the aforementioned AFT information signal comprises 8 bits, of which the 7<sup>th</sup> bit uses the logic state to indicate the automatic or manual storage mode, the 6<sup>th</sup> bit uses the logic state to indicate detuning in the negative (-) direction or the positive (+) from the center frequency, and the 0<sup>th</sup> – 5<sup>th</sup> bits are the fine-tuning data of the frequency value of detuning from the center frequency.

4. A fine-tuning method for the tuning number of the television [sic] characterized by the following steps:

1) when switching channels, the AFT information corresponding to the selected channel is read out to determine the automatic/manual storage mode;

2) if the storage mode is found to be the manual storage mode in the first step, the center frequency of the channel selected and the read AFT information are used to calculate and output the tuning data;

3) if the storage mode is found to be the automatic storage mode in the first step, the center frequency of the channel selected and the read AFT information are used to calculate and output the tuning data to evaluate the electrical level of the AFT signal;

4) if it is found in the third step that the electrical level of the AFT signal is not in the prescribed range, the tuning data can be changed to start a search operation, and the AFT information of the tuning number output when the electrical level falls within the prescribed range is stored for use for the next tuning cycle.

5. The fine-tuning method for the tuning number of the television described in Claim 4 characterized by the fact that in the aforementioned second and third steps, the selected channel appears on an OSD [on-screen display], and the color of the OSD display characters is set differently depending on the automatic storage mode and the manual storage mode.

6. A fine-tuning method for the tuning number of the television characterized by the fact that the fine-tuning method that uses fine-tuning up/down keys and channel setting keys to manually tune the tuning data of a television includes the following four steps:

1) when the aforementioned fine-tuning up/down keys are input, the current storage mode is determined;

2) if the storage mode is found to be the automatic storage mode in the first step, it is changed to the manual storage mode, and the current fine-tuning data are displayed;

3) if the storage mode is found to be the manual storage mode in the first step, the aforementioned input of the fine-tuning up/down keys is used to increase/decrease the tuning data for display;

4) when the aforementioned setting keys are input in the manual storage mode, the currently adjusted fine-tuning data are stored for use in the next tuning cycle.

7. The fine-tuning method for tuning the number of television described in Claim 6 characterized by the fact that in the aforementioned first-third steps, the selected channel appears on an OSD, and the color of the OSD display characters is set differently depending on the automatic storage mode and the manual storage mode to constitute different OSD displays.

## Specifications

### Fine-tuning device and method for tuning television data

The present invention pertains to a fine-tuning device and method for tuning television data. In particular, the present invention pertains to a fine-tuning device and method that that can be used by a user to manually and automatically fine-tune the tuning data of each channel when tuning detuned broadcasting signals and broadcasting signals in strong or weak electric field in order to receive a better picture.

Figure 1 shows a conventional fine-tuning device for tuning data. The aforementioned conventional device comprises a microcomputer (1) that controls the OSD (on-screen display) characters while outputting tuning data and controlling the broadcast signals, a remote control receiving unit (2) that receives the signals sent from a remote control unit (not shown in the figure) and inputs the signal into said microcomputer (1), a keypad (3) that is operated by the user to input operation instructions into microcomputer (1), tuning unit (4) that tunes and outputs the broadcast signals of a channel caused by the tuning data output from said microcomputer (1) among the signals received by an antenna (ANTI), intermediate frequency signal processing unit (5) that inputs the synchronizing signal of the broadcasting signals and AFT (automatic fine-tuning) signal into said microcomputer (1) while performing intermediate frequency processing of the signals output from said tuning unit (4), an image processing unit (6) that processes the image signals output from said intermediate frequency signal processing unit (5), an OSD character generator (7) that is controlled by said microcomputer (1) to generate OSD character signals, and synthesizer (8) that synthesizes the signals output from image processing unit (6) and OSD character generator (7) and then inputs the result to color display tube (9).

In the conventional fine-tuning device for tuning data with the aforementioned configuration, if the user operates the remote control to make remote control receiving unit (2) output a channel selection instruction or operates keypad (3) to make keypad (3) output a channel selection instruction, microcomputer (1) outputs the tuning data of the channel determined by the channel selection instruction to tuning unit (4). Tuning unit (4) tunes the broadcasting signals of the channel according to the tuning data of the broadcasting signals received by the antenna (ANTI) and then outputs tuned broadcasting signals. Intermediate frequency signal processing unit (5) performs intermediate frequency processing of the signals output from tuning unit (4) and then outputs the result. Also, in the meantime, when intermediate frequency signal processing unit (5) detects the synchronizing signal among the signals output from tuning unit (4) and inputs it into microcomputer (1), it also inputs the AFT signals detected according to the tuning state into microcomputer (1).

Microcomputer (1) determines whether the broadcasting signals of the channel selected by the user have been tuned according to the synchronizing signal input from intermediate frequency signal processing unit (5).

In other words, after the synchronizing signal is input, it is determined whether the broadcasting signal in the AFT signal has been tuned correctly. If the electrical level of the AFT signal is inconsistent with the set electrical level, an automatic fine-tuning operation is conducted while the tuning data output to tuning unit (4) are changed.

In this case, the AFT signal output from intermediate frequency signal processing unit (5) varies along with the tuning state of the broadcast signal. A certain electrical level range is set for

the output signal with the intermediate electrical level of the AFT signal used as center. If the electrical level of the AFT signal input from intermediate frequency signal processing unit (5) is in the aforementioned set range, it means that the broadcasting signal has been tuned correctly. If the broadcasting signal is out of the set range, it means that the broadcasting signal has not been tuned correctly. Also, as shown in Figure 2, microcomputer (1) divides a frequency band of broadcasting signal, such as the frequency band of 6 MHz, into a first search area of  $f_0 \pm 1$  MHz, a second search area of  $(f_0 - 1.5) \pm 1$  MHz, and a third search area of  $(f_0 + 1.5) \pm 1$  MHz with reference to center frequency  $f_0$  and searches the broadcasting signal. In other words, during the initial channel tuning, the microcomputer outputs the PLL (phase-locked loop) data of the tuning data of  $f_0$ . If the electrical level of the AFT signal input according to the tuning data of  $f_0$  is not in a prescribed set range, the microcomputer will output the tuning data in the first search area and starts a search operation. If the electrical level of the AFT signal is still unable to fall within the set range after the search operation in the first search area is completed, the search operation in the second and third search area will be conducted sequentially. If the electrical level of the AFT signal is once again unable to satisfy the set range after the search operation in the third search area is completed, it means that there is no channel corresponding to this broadcasting signal, and the automatic fine-tuning operation will be ended after the tuning data of  $f_0$  are output.

If an image signal is output from intermediate frequency signal processing unit (5) after the broadcasting signal of the channel selected in this way is tuned, the output image signal will be sent out to synthesizer (8) after it is subjected to image processing conducted by image processing unit (6). On the other hand, an OSD character signal is generated by OSD character generator (7) under the control of microcomputer (1), the generated OSD character signal is output to synthesizer (8), where it is synthesized with the image signal sent from image processing unit (6). Then, the synthesized signal is output to color display tube (9). As a result, an image signal is generated for the color display tube, which displays the OSD characters in the meantime.

In the aforementioned conventional fine-tuning, however, since fine-tuning is usually initiated from the first search area and then to the second and third search areas, if the broadcasting signal occurs in the first search area, the picture will not flicker, and correct tuning can be conducted directly. However, if there is a broadcasting signal in the second or third search area, flickering of the picture will occur during the transition period from the first search area to the second and third search areas. Also, even if the broadcasting signal is detected during the search, since the set range of the electrical level of the AFT signal is associated with the detuning state, the broadcast signal cannot be tuned correctly. As a result, the picture quality is poor, which makes the viewer uncomfortable.

One purpose of the present invention is to solve the aforementioned problem by providing a fine-tuning device and method for tuning television data, which can correctly tune the broadcasting signal with a detuning frequency of each selected channel.

Another purpose of the present invention is to provide a fine-tuning device and method for tuning television data so that the detuning frequency can be calculated and stored after a search of broadcasting signal in a certain stage when the broadcasting signal of the selected channel has not been tuned correctly. In this way, when the second tuning is performed for the broadcasting signal of the current channel, since the stored data are used, flickering of the picture can be avoided during tuning while tuning of the broadcasting signal can be done more quickly.

Still another purpose of the present invention is to provide a fine-tuning device and method for tuning television data, which use fine-tuning up/down keys to manually increase/decrease the tuning data to tune the broadcasting signal. When the increased/decreased tuned data are stored for use during the next tuning cycle, since the data generated in this way are used, the broadcasting signal can be tuned correctly even if the set range for the electrical level of the AFT signal is detuned.

In order to realize the aforementioned purpose, the present invention provides a type of fine-tuning device for tuning television data characterized by the following structure:

a microcomputer that provides the tuning data for controlling tuning of the broadcasting signals of a selected channel;

a tuner that tunes the broadcasting signals of the selected channel from the broadcasting signals received by an antenna on the basis of aforementioned tuning data provided by the aforementioned microcomputer;

an intermediate frequency signal processor that performs intermediate frequency processing of the broadcasting signals of the channel selected and output from the aforementioned tuner to detect the synchronizing signal and automatic fine-tuning (AFT) signal from the aforementioned broadcasting signals and supplies them to the intermediate frequency signal processor of the aforementioned microcomputer;

an AFT information storage mechanism for storing the AFT information of the detuning frequency of the broadcasting signals of each received channel according to the control of the aforementioned microcomputer; and

fine-tuning up/down keys that have data connection with the aforementioned microcomputer and are used manually to increase/decrease the aforementioned tuning data supplied to the aforementioned tuner from the aforementioned microcomputer; wherein,

when the aforementioned microcomputer changes channels, it calculates tuning data from the center frequency data of the selected channel and the aforementioned AFT information data stored in aforementioned AFT information storage mechanism and increases/decreases the



aforementioned tuning data depending on the input of the aforementioned fine-tuning up/down keys, and finally outputs the tuning data.

The present invention also provides a fine-tuning method for tuning number of television characterized by the following steps:

- 1) when switching channels, the AFT information corresponding to the selected channel is read out to determine the automatic/manual storage mode;
- 2) if the storage mode is found to be the manual storage mode in the first step, the center frequency of the channel selected and the read AFT information are used to calculate and output the tuning data;
- 3) if the storage mode is found to be the automatic storage mode in the first step, the center frequency of the channel selected and the read AFT information are used to calculate and output the tuning data to evaluate the electrical level of the AFT signal;
- 4) if it is found in the third step that the electrical level of the AFT signal is not in the prescribed range, the tuning data can be changed to start a search operation, and the AFT information of the tuning number output when the electrical level falls within the prescribed range is stored for use for the next tuning cycle.

In the present invention, when the microcomputer changes channels, it will read the AFT information data corresponding to the selected channel from the AFT information storage mechanism, calculate the tuning data from the AFT information data and the center frequency data of the selected channel, and output the tuning data to the tuner.

At that time, the electrical level of the AFT signal output from the tuner is detected. If the electrical level of the AFT signal is not within a preset range, the tuning data will be changed, and a search operation will be initiated. If the electrical level of the AFT signal is within the preset range, the AFT information of the currently output tuning data is stored for use in the next tuning cycle.

In the following, an application example of the present invention will be explained in detail with reference to the attached figures. Figures 1 and 2 were referred to in the explanation above pertaining to the prior art.

Figure 1 is a block diagram illustrating the configuration of a conventional fine-tuning device for tuning data.

Figure 2 is a diagram illustrating the tuning data area output from the microcomputer shown in Figure 1.

Figure 3 is a block diagram illustrating the configuration of the fine-tuning device of the present invention.

Figure 4 is a block diagram illustrating the internal structure of the AFT information storage unit shown in Figure 3.

Figure 5 is a table explaining the data contents of the AFT information storage unit shown in Figure 3.

Figure 6 is a flow chart explaining the fine-tuning method for tuning data of the present invention.

Figure 7 is a flow chart explaining the manual fine-tuning method in the fine-tuning method of the present invention.

Figure 8 is a diagram explaining an example of the OSD state on the screen during manual fine-tuning of the present invention.

Figure 9 is a diagram explaining an example of the channel display state on the screen during manual fine-tuning of the present invention.

Figure 3 shows an application example of the fine-tuning device for tuning data disclosed in the present invention. As shown in Figure 3, the device of the present invention includes microcomputer (10) that outputs the tuning data of the selected channel to control the tuning of the broadcast signals and to control the display of OSD characters, remote control receiving unit (11) and keypad (12) that receive the signals of the operating keys as a result of the operation by the user and input the signals into said microcomputer (10), tuner (13) that tunes the signals of the channel determined by the tuning data output from microcomputer (10) from the broadcasting signals received by an antenna (ANTENNA), intermediate frequency signal processing unit (14) that performs intermediate-frequency signal processing of the channel signals output from tuner (13) and, in the meantime, detects the synchronizing signal and AFT signal from the broadcast signals and sends them to microcomputer (10), and image processing unit (15) that processes the image signals output from said intermediate frequency signal processing unit (14).

The device of the present invention also has an AFT information storage unit (16) that stores and outputs the AFT information of the detuning frequency with respect to the broadcast signal of each received channel under the control of microcomputer (10), fine-tuning up/down keys (17) that are used to increase/decrease the tuning data output from microcomputer (10) as a result of a search operation, OSD character generator (18) that generates OSD character signals under the control of microcomputer (10), and synthesizer (19) that synthesizes the signals output from image processing unit (15) and OSD character generator (18) and outputs the result to color image display tube (20).

As shown in Figure 4, said AFT information storage unit (16) is comprised of serial/parallel shift register (161) that converts the address signal and AFT information signal output in series from microcomputer (10) into parallel signals via a clock signal CLK and then outputs the parallel signals, register (162) that adjusts the aforementioned AFT information signal according to the input enable signal ME output from microcomputer (10) at the address set according to the address signal output from said serial/parallel shift register (161) so that the

aforementioned stored AFT information signal can be output according to a read enable signal RE, and buffer register (163) that temporarily stores the AFT information signal output from said register (162) and then outputs it to microcomputer (10).

In this case, the AFT information signal stored and output by the register (162) of AFT information storage unit (16) comprises 8 bits. That is, as shown in Figure 5, the 7<sup>th</sup> bit uses the binary logic state to indicate manual or automatic storage mode. The 6<sup>th</sup> bit uses the binary logic state to indicate detuning in the negative or positive direction with respect to the center frequency. The 0<sup>th</sup>-5<sup>th</sup> bits are the fine-tuning data of the frequency detuned with respect to the center frequency.

The characteristics of the fining tuning device and method of the present invention with the aforementioned configuration will be explained in detail with reference to Figures 3-9.

If a user operates a remote control signal emitter to input channel switching data into microcomputer (10) via remote control receiving unit (11) or operates keypad (12) to input channel switching data into microcomputer (10) via keypad (12), said microcomputer (10), as shown in Figure 6, will evaluate the input channel switching data and read the AFT information of the corresponding channel from AFT information storage unit (16).

That is, if the address signal of the corresponding channel and clock signal CRL are output together to serial/parallel shift register (161) via the output terminal DO of microcomputer (10), serial/parallel shift register (161) will shift the address signal according to clock signal CRL. Once the shifting of the address signal is completed, microcomputer (10) outputs read enable signal RE to enable reading from register (162) and, in the meantime, starts buffer register (163). At that time, the AFT information stored at the address corresponding to the address signal output in parallel from serial/parallel shift register (161) is output from register (162). The output AFT information is input to the input terminal DI of microcomputer (10) via buffer register (163).

Once the AFT information of the channel selected by the user is read as described above, microcomputer (10) determines whether the storage mode is the automatic or manual storage mode on the basis of 7<sup>th</sup> bit of the AFT information. If the storage mode is the manual storage mode, the color of the OSD characters generated for manual storage mode is selected, and OSD character generator (18) is controlled to output the characters of the selected channel to the selected color. The characters selected by said OSD character generator (18) are displayed on color image display tube (20) through synthesizer (19).

Then, microcomputer (10) processes the tuning data.

That is, the 6<sup>th</sup> bit of the AFT information is used to determine whether the frequency is detuned in positive (+) direction or negative (-) direction. According to the determined detuning direction, the fine-tuning data of the 0<sup>th</sup>-5<sup>th</sup> bits are added or subtracted from the center frequency

data of the selected channel to calculate the tuning data. Then, the calculated tuning data are output to tuner (13).

In this way, if the tuning data calculated by microcomputer (10) are input into tuner (13), tuner (13) can tune the broadcasting signal according to the tuning data and then output the tuned signal.

The output signal of tuner (13) is subjected to intermediate frequency processing in intermediate frequency signal processing unit (14) and is then output as an image signal. Also, the synchronizing signal and AFT signal are detected from this image signal and input into microcomputer (10) to indicate the end of tuning of the broadcasting signal on the basis of tuning data. The image signal output from intermediate frequency signal processing unit (14) is subjected to image processing in image processing unit (15). After it is synthesized with the OSD character signal in synthesizer (19), the signal is output to color image display tube (20) and displayed on screen.

On the other hand, if the logic state of the 7<sup>th</sup> bit of the AFT information read by microcomputer (10) is "0," which indicates the automatic storage mode, the color of OSD characters generated in automatic storage mode will be selected to display the channel. In other words, a color different from that for the aforementioned manual storage mode is used to select OSD characters. After the OSD character generator is controlled to display the channel on color image display tube (20), the tuning data are calculated and sent to tuner (13), which tunes the broadcast signal. After tuning is completed, the electrical level of the AFT signal output from intermediate frequency signal processing unit (14) is evaluated.

If the electrical level is not in the AFT state, after the tuning data are changed and output, it is determined whether the output tuning data are within the limit frequency range of the selected channel.

If the tuning data are within the limit frequency range, a search operation will be initiated to determine whether the AFT state is satisfied. If the AFT state is satisfied, AFT information storage unit (16) is controlled to store the current AFT information at the corresponding address so that the current channel can be used in the next tuning cycle.

In other words, the 7<sup>th</sup> bit of the AFT information turns to "0," indicating automatic storage mode; the 6<sup>th</sup> bit turns to "0" or "1," with respect to the detuning direction of the center frequency of the current channel, according to the tuning data; and the 0<sup>th</sup>-5<sup>th</sup> bits form the fine-tuning data. Such ATF information and the corresponding address signal are output from the output terminal DO of microcomputer (10) and are shifted in serial/parallel shift register (161). Once the shift is completed, a write enable signal WE is output to enable writing to register (162) so that the AFT information can be stored at the corresponding address.

After the AFT information (data) is stored as described above, if that channel is again selected later, the AFT information stored at the corresponding address of the register shown in Figure 4 will be read out. Since there is no need to perform a step-wise search in the first, second, and third search areas as in the conventional technology, the tuning data can be determined immediately according to the read data, as in step A shown in Figure 6. The picture flickering problem of the conventional technology caused by the difference in signals and search areas can be avoided.

On the other hand, if the user presses fine-tuning up/down keys (17) to increase/decrease the fine-tuning data as shown in Figure 7 when the broadcasting signal of the channel selected as described above is being tuned, a display will appear on screen as shown in Figure 8. If the fine-tuning up/down keys are not in the input state, the input state of the setting key should be evaluated. If there is input from the setting key, it is determined whether the fine-tuning data are in the state shown in Figure 8, and the adjusted fine-tuning data of the displayed state are stored. The channel is displayed in the color of the OSD characters generated for the manual storage mode as shown in Figure 9. If the input is neither from the setting key nor in the display state of the fine-tuning data, it means that the input is from other external keys, and the operation is immediately terminated.

As explained above, according to the present invention, the AFT information of each channel is stored. During channel selection, the tuning data are output on the basis of aforementioned stored AFT information of the corresponding channel. When the broadcasting signal is being tuned, even if the frequency of the broadcasting signal is detuned, there is no flickering of the picture, and the broadcasting signal can be quickly tuned.

In addition, the tuning data can be changed by the viewer. Consequently, even if the set area for the electrical level of the AFT signal is detuned or tuning is performed to a broadcasting signal in a strong or weak electric field, the broadcasting signal can still be tuned correctly.

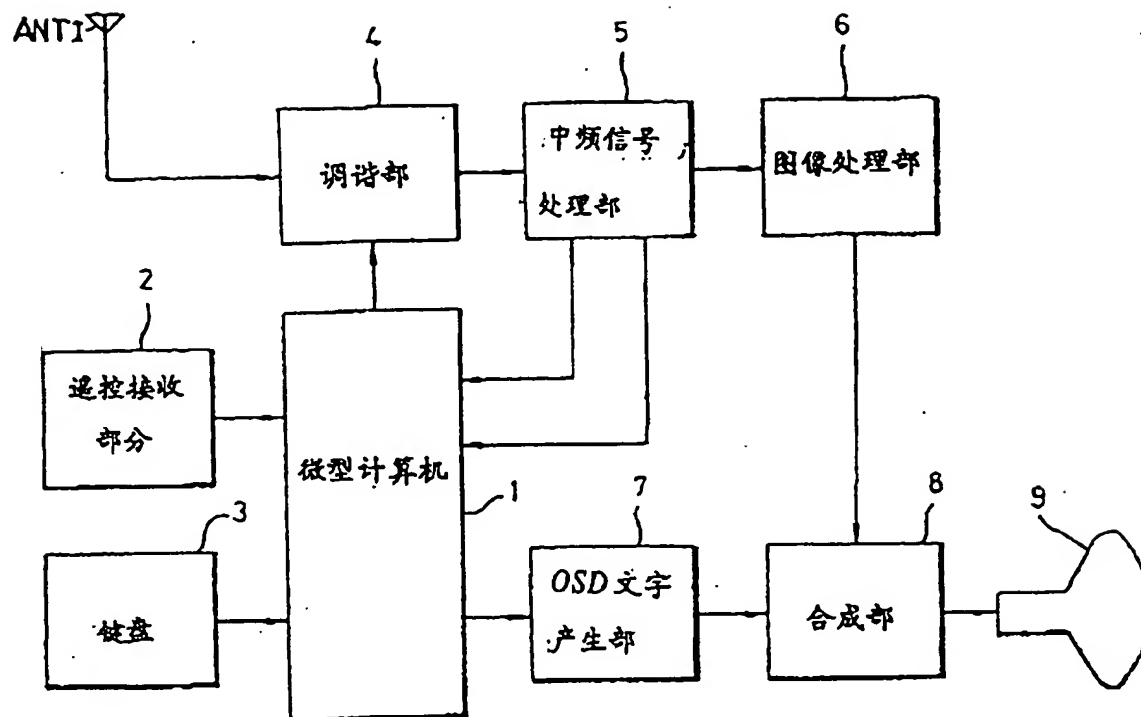


Figure 1

- Key:
- 1 Microcomputer
  - 2 Remote control receiving unit
  - 3 Keypad
  - 4 Tuner
  - 5 Intermediate frequency signal processing unit
  - 6 Image processing unit
  - 7 OSD character generator
  - 8 Synthesizer

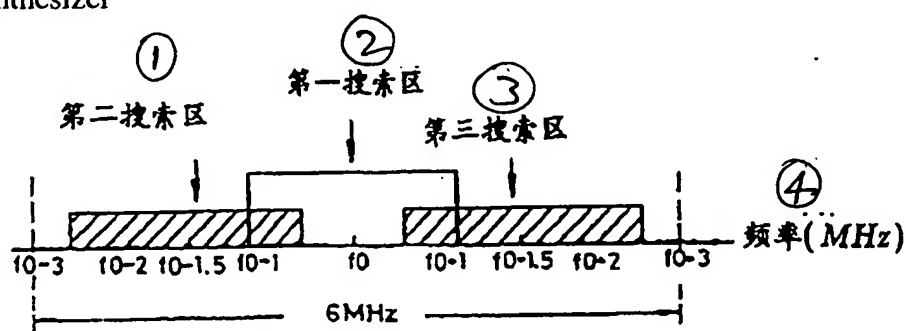


Figure 2

- Key:
- 1 Second search area
  - 2 First search area
  - 3 Third search area
  - 4 Frequency

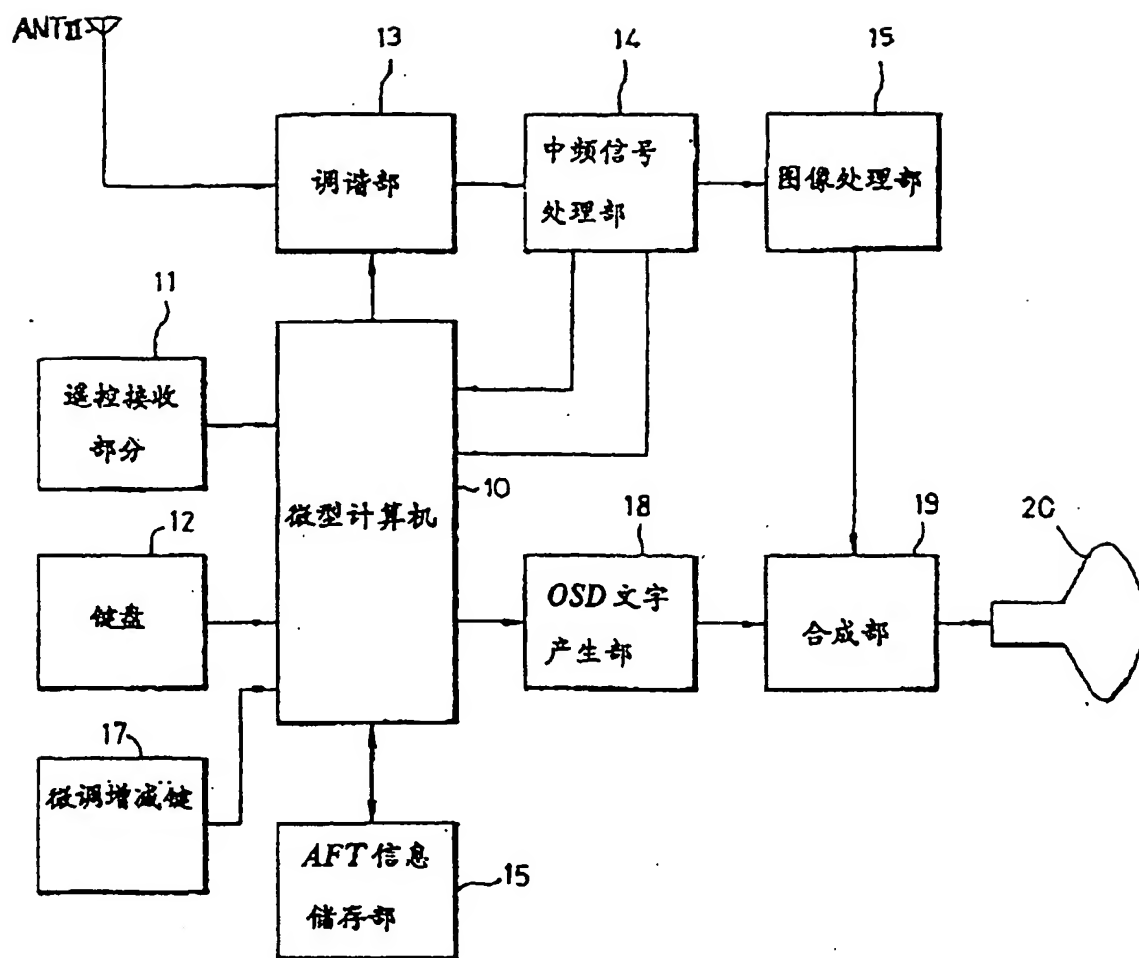


Figure 3

- Key:
- |          |   |
|----------|---|
| 10       | Microcomputer                                 |
| 11       | Remote control receiving unit                 |
| 12       | Keypad  |
| 13       | Tuning unit                                   |
| 14       | Intermediate frequency signal processing unit |
| 15       | Image processing unit                         |
| 15 [sic] | AFT information storage unit                  |
| 17       | Fine-tuning up/down keys                      |
| 18       | OSD character generator                       |
| 19       | Synthesizer                                   |

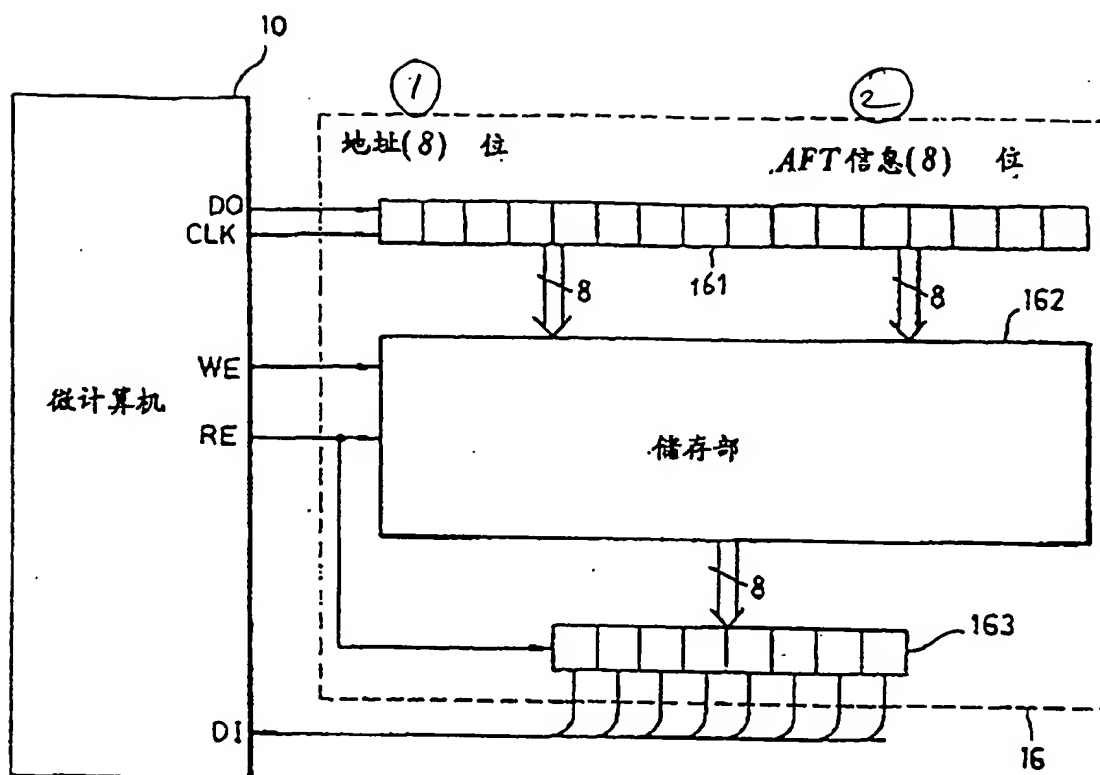


Figure 4

Key: 1 Address (8) bit  
 2 AFT information (8) bit  
 10 Microcomputer  
 162 Storage unit

①	位	⑤ 逻辑状态	⑥ 区分
②	第7位	0	⑦ 自动储存模式
		1	⑧ 手动储存模式
③	第6位	0	⑨ 朝(-)方向失调
		1	⑩ 朝(+)方向失调
④	第5~第0位		⑪ 所失调频率的微调数据

Figure 5



Key:	1	Bit
	2	7 <sup>th</sup> bit
	3	6 <sup>th</sup> bit
	4	0 <sup>th</sup> -5 <sup>th</sup> bits
	5	Logic state
	6	Function
	7	Automatic storage mode
	8	Manual storage mode
	9	Detuning in (-) direction
	10	Detuning in (+) direction
	11	Fine-tuning data of the detuned frequency

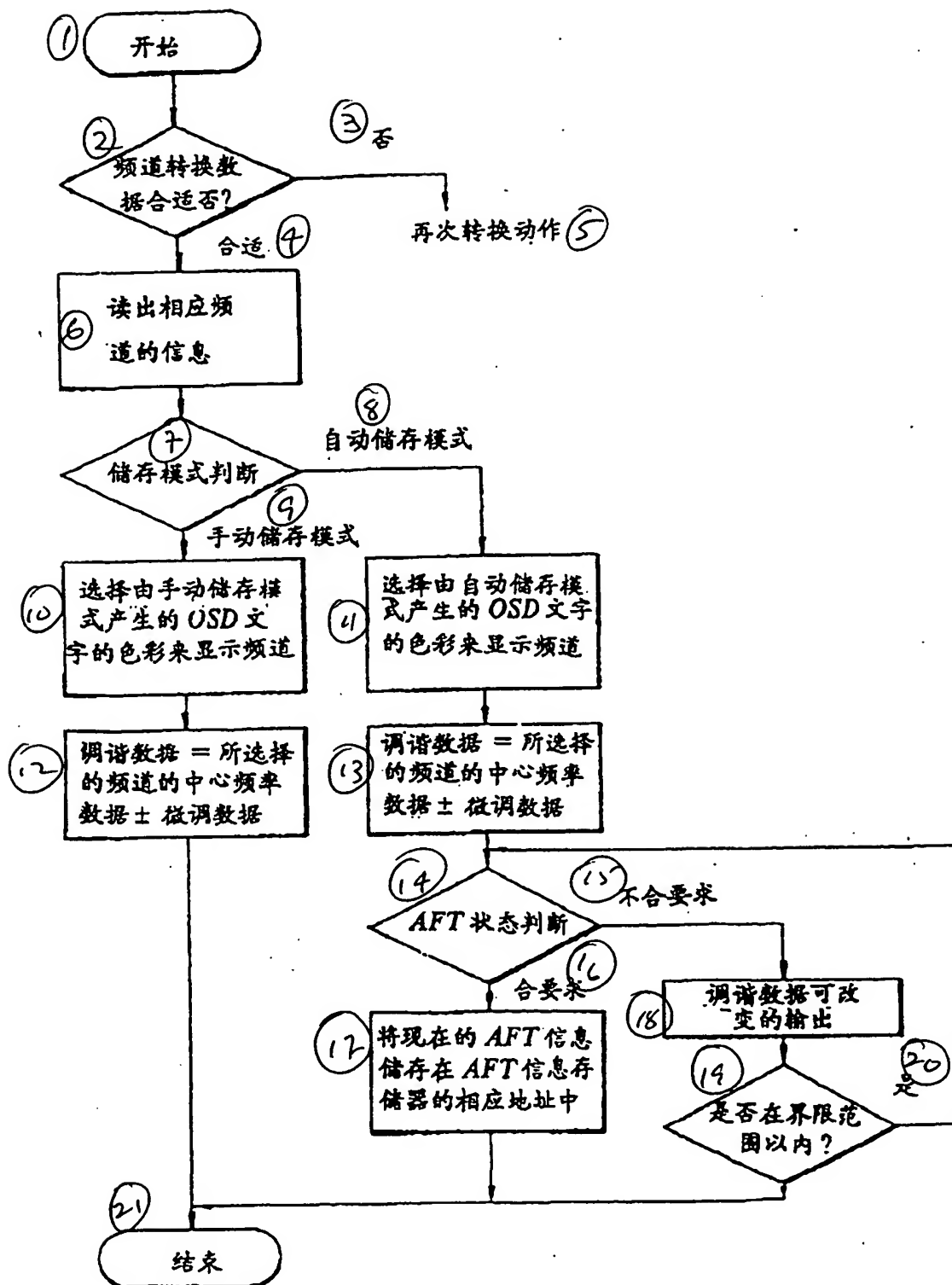


Figure 6

- Key: 1 Start  
 2 Is the channel switching data ok?  
 3 No

- 4 Yes
- 5 Another switching operation
- 6 Read the information of the corresponding channel
- 7 Evaluate storage mode
- 8 Automatic storage mode
- 9 Manual storage mode
- 10 Select the color of the OSD characters generated for the manual storage mode to display the channel
- 11 Select the color of the OSD characters generated for the automatic storage mode to display the channel
- 12 Tuning data = Center frequency of the selected channel  $\pm$  fine-tuning data
- 13 Tuning data = Center frequency of the selected channel  $\pm$  fine-tuning data
- 14 Judgment of the AFT state
- 15 Does not meet requirements
- 16 Meets requirements
- 17 Store the current AFT information at the corresponding address of the AFT information storage unit
- 18 Output with variable tuning data
- 19 Is it within the limit range?
- 20 Yes
- 21 End

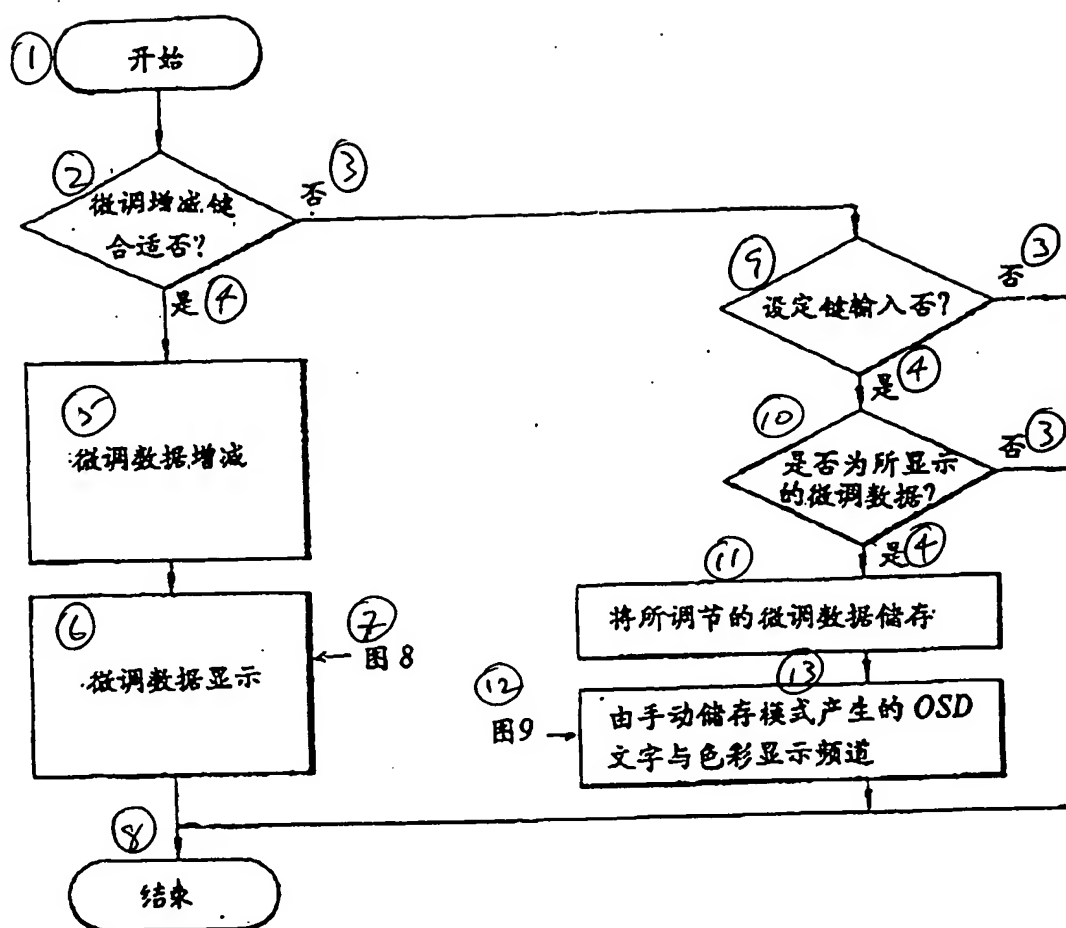


Figure 7

- Key:
- |    |  |
|----|--|
| 1  | Start  |
| 2  | Are fine-tuning up/down keys ok?   |
| 3  | No   |
| 4  | Yes  |
| 5  | Increase/decrease fine-tuning data   |
| 6  | Display of the fine-tuning data  |
| 7  | Figure 8   |
| 8  | End  |
| 9  | Is there input from the setting key?   |
| 10 | Is it the displayed fine-tuning data?  |
| 11 | Store the adjusted fine-tuning data  |
| 12 | Figure 9   |
| 13 | Display the channel using the OSD characters and color generated for the manual storage mode |

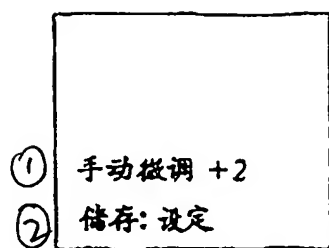


Figure 8

Key: 1 Manual fine-tuning + 2  
2 Store: Set

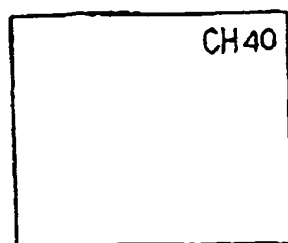


Figure 9

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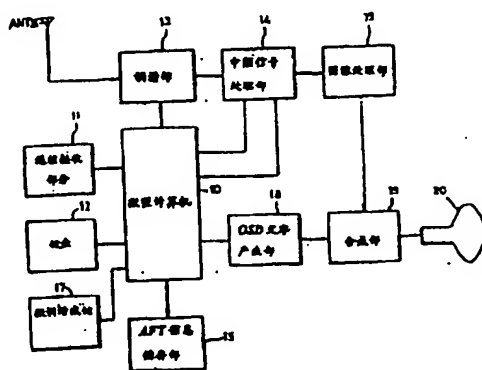
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[54]发明名称 电视机调谐数据微调装置及其方法

[57]摘要

一种电视机的调谐数据微调装置及方法, 使在频道转换时, 即使处在失调的广播信号或强电场及弱电场广播信号等的异常状态中, 通过手动及自动方式对调谐数据进行微调, 在不发生画面抖动情况下迅速进行调谐。

本发明的装置包含储存以中心频率为基准的失调频率的 AFT 信息的储存器, 和在读出适当 AFT 信息后, 对所选择频道的中心频率与读出的 AFT 信息进行运算而算出调谐数据的微型计算机。该装置还可设置微调增减键。



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## 权 利 要 求 书

1、一种电视机的调谐数据微调装置，其特征在于它具有如下的结构：

提供对所选择频道的广播信号的调谐进行控制用的调谐数据的微型计算机；和

用上述微型计算机来的上述调谐数据，对通过天线接收的广播信号中所选择频道的广播信号进行调谐的调谐器；和

对由上述调谐器选择并输出的频道的广播信号进行中频处理，从上述广播信号中检出同步信号及自动微调（A F T）信号并供给所述微型计算机的中频信号处理机构；和

根据上述微型计算机的控制，相对于所接收的各个频道的广播信号储存失调频率的A F T信息的A F T信息存储机构；以及

与上述微型计算机的数据连结、通过手动使由上述微型计算机供给上述调谐器的上述调谐数据增减的微调增减键，上述微型计算机在频道转换时，对所选择的频道的中心频率数据与上述A F T信息存储机构的上述A F T信息数据进行运算以算出调谐数据，通过上述微调增减键的输入使上述调谐数据增减后输出。

2、一种如权利要求1所记载的电视机调谐数据微调装置，其特征在于上述A F T信息存储机构有如下结构：

将由上述微型计算机串行输出的上述地址信号及A F T信息信号变换成并行输出的串行/并行移位寄存器；和

根据上述微型计算器输出允许写入信号将上述A F T 信息信号储存在根据上述串行/ 并行移位寄存器输出的地址信号而设计的地址中, 根据允许读出信号输出所储存的上述A F T 信息信号的存储器; 以及

将上述存储器输出的上述A F T 信息信号临时存储起来, 然后输送给上述微计算机的缓冲存储器。

3 、一种如权利要求1 记载的电视机调谐数据微调装置, 其特征不在于上述A F T 信息信号由8 位构成, 其中第7 位按逻辑状态表示为自动或手动存储模式, 第6 位按逻辑状态表示从中心频率向负 (-) 方向或正 (+) 方向失调, 第5 至第0 位是从中心频率失调的频率值的微调数据。

4 、一种电视机调谐数的微调方法, 其特征不在于由下列步骤构成:

1 ) 在频道转换时, 读出对应于所选择频道的A F T 信息, 对自动/ 手动存储模式进行判断的步骤;

2 ) 在判断出上述第1 步骤为手动储存模式时, 用所选择频道的中心频率与读出的A F T 信息算出并输出调谐数据的步骤;

3 ) 在判断出上述第1 步骤为自动储存模式时, 在所选择频道的中心频率与所读出的A F T 信息算出调并输出谐数据, 对A F T 信号电平进行判断的步骤;

4 ) 在上述第3 步骤中A F T 信号电平不处在予定的区域范围内时, 可改变调谐数据进行搜索动作, 在处于予定的区域范围内时, 将由现在输出的调谐数的A F T 信息储存起来以供下次调谐时使用的步骤。

5 、一种如权利要求4 所记载的电视机调谐数据的微调方法, 其特征不在于在上述第2 及第3 步骤中, 所选



择的频道以OSD表示，该OSD表示文字的色彩根据自动贮存模式及手动贮存模式分别设定成不同色彩。

6、一种电视机的调谐数据微调方法，其特征在于设置了微调增减键与频道设定键，在用这些键以手动方式进行电视机调谐数据的微调方法中，包括以下四个步骤：

1) 在上述微调增减键输入时，判断现在存储模式的步骤；

2) 在上述第1步骤中判断出存储模式为自动存储模式时，变换成手动存储模式，显示出现在的微调数据的步骤；而

3) 在上述第1步骤中判断出存储模式为手动存储模式时，用上述微调增减键输入使调谐数据增减而显示的步骤；而且

4) 在手动存储模式状态中，上述设定键输入时，为了下次调谐时使用而将现在调节的微调谐数据储存起来的步骤。

7、一种如权利要求6记载的电视机调谐数据微调方法，其特征在于在上述第1至第3步骤中，所选择的频道以OSD方式表示，根据自动存储模式及手动存储模式分别设定不同的OSD显示文字的色彩，构成不同的OSD显示。

# 说明书

## 电视机调谐数据微调装置及其方法

本发明涉及电视机的调谐数据微调装置及调节方法，特别是涉及在失调广播信号和强电场及弱电场广播信号等的调谐时，使用者对各频道的调谐数据进行自动及手动的微调而可能视听到更好广播信号的接收画面的电视机调谐数据微调装置及调节方法。

已有的调谐数据微调装置显示于图1。上述已有的装置是由输出调谐数据并对电视广播信号的调谐进行控制同时，对OSD（在屏幕上显示的）文字的显示进行控制的微型计算机1，和用来接收遥控发射部（图中没示出）的发射信号而将动作指令输入上述微型计算机1中的遥控接收部2，和通过使用者操作以便将动作指令输入微型计算机1的键盘（key Pad）3，和在天线（ANTENNA）的接收信号中，将上述微型计算机1输出的调谐数据而引起的频道广播信号调谐后输出的调谐部4，和在对上述调谐部4的输出信号进行中频处理并输出的同时将广播信号的同步信号及AFT（自动微调）信号输入到上述微型计算机1的中频信号处理部5，和对上述中频信号处理部5输出的图像信号进行处理的图像处理部6，和由上述微型计算机1的控制而产生OSD文字信号的OSD文字产生部7，以及对上述图像处理部6及OSD文字产生部7的输出信号进行合成而输出到彩色显像管9的合成部8组成的。

在这样构成的已有的调谐数据微调装置中，如使用者操纵遥控发射器使遥控接收部2输出频道选择命令，

或是操纵键盘3使键盘3输出频道选择命令，则微型计算机1输出因频道选择命令而决定的频道调谐数据并输送给调谐部4。调谐部4在天线(A N T I)接收的广播信号中根据调谐数据而将频道的广播信号经调谐后输出，中频信号处理部5将调谐部4的输出信号进行中频处理后输出。还有，中频信号处理部5从调谐部4的输出信号中检出同步信号，输入到上述微型计算机1的同时，根据调谐状态检出的A F T信号并输入到微型计算机1中。

微型计算机1根据从中频信号处理部5输入的同步信号判断使用者所选择的频道广播信号是否经过调谐。

就是说，在输入同步信号的情况下，判断在A F T信号电平中广播信号是否经过正确地调谐、A F T信号的电平与所设定的电平不一致时，一边改变输出到调谐部4的调谐数据，一边进行自动微调动作。

这里，中频信号处理部5输出的A F T信号是随广播信号的调谐状态而变的，该输出信号是以A F T信号的中间电平为中心设定一定区域的电平，而由中频信号处理部5输入的A F T信号电平是处在已经设定的一定区域内的场合，则判断广播信号是正确调谐的，而广播信号若处在所设定的一定区域的外的场合则判断为没有正确调谐的。另外，在微型计算机1中如图2所示，一个广播信号的频带，例如在6 M H z 的带区中，以中心频率 $f_0$ 为基准分成 $f_0 \pm 1$  M H z 的第一搜索区域、

$(f_0 - 1.5) \pm 1$  M H z 的第二搜索区域和  $(f_0 + 1.5) \pm 1$  M H z 的第三搜索区域并进行广播信号搜索。就是说，在最初频道调谐时，将具有 $f_0$ 的调谐数据的P L L (相位锁定回路)数据输出，在按照该 $f_0$

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的调谐数据输入的A F T 信号电平不满足所设定的一定区域时,就输出第一搜索区中的调谐数据并进行搜索动作。如果,在第一搜索区的搜索动作完成之后,接着A F T 信号电平仍然不满足所设定的区域时,则依次进行第二搜索区和第三搜索区的搜索动作。直至第三搜索区的搜索动作全部完成之后,A F T 信号电平还不能满足所设定的一定区域时,则认为没有该广播信号的频道,在输出f。调谐数据之后,结束自动微调动作。

如将经过这样选择的频道的广播信号调谐再由中频信号处理部5 输出图像信号,则所输出的图像信号经图象处理部6 进行图像处理之后输出至合成部8。还有,OS D 文字发生部7 在微型计算机1 控制下产生OS D 文字信号,所产生的OS D 文字信号被输送到合成部8,与由图像处理部6 来的图像信号合成之后,输出到彩色显像管9,从而在彩色显像管上产生图像信号为同时也显示出OS D 文字。

但是,上述这样已有的调谐数据微调装置,由于通常从第一搜索区开始到第二搜索区和第三搜索区进行微调,所以在第一搜索区出现广播信号时,画面不摆动,直接进行正确的调谐,但在第二或第三搜索区有广播信号的情况下,从第一搜索区域向第二搜索区和第三搜索区移动期间就有产生画面抖动的问题。而且,在搜索时,广播信号即使检出,但A F T 信号电平的设定区域处在失调的情况下,不能对广播信号进行正确调谐,因此画面质量差,给使用者以不舒适感。

因此,本发明的目的在于克服上述那样已有的各种问题,提供能够对各个选择频道失调频率的广播信号进行正确调谐的电视机的调谐数据微调装置及其方法。

本发明的另一目的在于提供一种电视机的调谐微调装置及其方法，以便在所选择的频道广播信号没有得到正确调谐时，在进行分阶段的广播信号搜索动作之后，算出失调频率并存储，因此，在对现在的频道广播信号进行第二次调谐时，由于使用所储存数据，所以加速调谐广播信号的同时，也防止调谐时画面抖动。

本发明的又一个目的在于提供电视机的调谐数据微调装置及其方法，该装置及其方法是设置微调增减键，利用该微调增减键通过手动调节一边增减调谐数据一边调谐广播信号，将这样增减的调谐数据储存起来，以便在下次调谐时，由于使用这样产生的数据，从而A F T信号电平の設定区域即使失调也可能对广播信号进行正确调谐。

为了达到上述目的，本发明提供下述那样结构的电视机调谐数据微调装置，该装置具有：为控制所选择频道广播信号调谐而提供调谐数据的微计算机；和

根据上述微型计算机来的上述调谐数据对通过天线所接收的广播信号中所选择的频道广播信号进行调谐的调谐器；和

对由上述调谐器选择及输出的频道广播信号进行中频处理，从上述广播信号中检出同步信号及自动微调（A F T）信号并提供给微计算机的中频信号处理机构；和

根据上述微计算机控制相对于所接收的各个频道广播信号储存失调频率的A F T信息的A F T信息存储机构；和

与上述微计算机数据连接并用手动增减从上述微计算机供给上述调谐器的上述调谐数据的微调增减键；

还有在上述微计算机作频道转换时，演算所选择频道的中心频率数据和上述A F T 信息存储机构的上述A F T 信息数据并算出调谐数据，随着上述微调增减键的输入使上述调谐数据增减后输出。

另外，本发明还提供了由下述步骤组成的电视机调谐数据的微调方法。

1 ) 在频道转换时，读出相对于所选择频道的A F T 信息并判断自动/ 手动存储模式的步骤； 和

2 ) 在判断上述第一步骤为手动存储的场合，用所选择的频道的中心频率和所读出的A F T 信息算出调谐数据后输出的步骤； 和

3 ) 在判断上述第一步骤为自动存储的场合，用所选择的频道的中心频率和所读出的A F T 信息算出调谐数据后输出，判断A F T 信号电平的步骤； 以及

4 ) 上述第3 步骤的A F T 信号电平不在已设定区域范围内时，改变调谐数据进行搜索动作，在已设定的区域范围内时，为将取决于现在输出的调谐数据的A F T 信息用于下一次的调谐过程的储存的步骤。

在这样的本发明中，微型计算机在频道转换时，将对应于所选择频道的A F T 信息数据从A F T 信息存储机构读出，将该A F T 信息数据与所选择频道的中心频率数据一起进行演算，算出调谐数据并输送给调谐器。

这时，检出从调谐器输出的A F T 信号电平，若该A F T 信号电平不在已设定的区域内时，则改变调谐数据进行搜索动作。而若A F T 信号电平是在已设定的区域内时，则将取决于现在输出的调谐数据的A F T 信息储存起来以待下次调谐时应用。

以下参照附图对本发明实施例进行详细说明。图1

和图2 作为已有技术已在前面说明, 其中:

图1 是表示已有的调谐数据微调装置结构的方框图。

图2 是用于说明图1 微计算机输出的调谐数据区域的图。

图3 是表示本发明的调谐数据微调装置结构的方框图。

图4 是表示图3 中的A F T 信息存储部内部结构的方框图。

图5 是用于说明储存在图3 内的A F T 信息存储部的数据内容的图表。

图6 是为了说明本发明的调谐数据微调方法的算法图。

图7 是为了说明在本发明的调谐数据微调方法中的手动微调方法的算法图。

图8 是在本发明的手动微调时, 表示画面的O S D 状态的例子说明图。

图9 是在本发明的手动微调时, 表示画面的频道表示状态的例子说明图。

图3 表示本发明的调谐数据微调装置的实施例。参照图3, 本发明的装置包括有输出所选择频道的调谐数据从而控制广播信号调谐并控制O S D 文字表示的微型计算机1 0, 和由使用者的操作受动作键的信号输入上述微型计算机1 0 的遥控接收部1 1 及键盘1 2, 和在由天线(A N T I I)所接收的广播信号中对取决于上述微型计算机1 0 输出的调谐数据的频道信号进行调谐的调谐器部1 3; 和对上述调谐器部1 3 输出的频道信号进行中频信号处理的同时, 从该广播信号中将同步信号及A F T 信号检出并输送到上述微型计算机1 0 的中频信号

处理部1 4 以及对上述中频信号处理部1 4 输出的图像信号进行信号处理的图像处理部1 5 。

而且, 本发明的装置还有根据微型计算机1 0 的控制将对所接收的各个频道广播信号将失调频率的A F T 信息进行储存并输出的A F T 信息存储部1 6 , 和由于搜索操作使上述微计算机1 0 输出的调谐数增减的微调增减键1 7 , 和由上述微计算机1 0 的控制而产生O S D 文字信号的O S D 文字发生部1 8 , 和对上述图像处理部1 5 及O S D 文字发生部1 8 的输出信号进行合成而输出至彩色显像管2 0 的合成部1 9 。

参见图4 , 上述A F T 信息存储部1 6 是由将微计算机1 0 串行输出的地址信号及A F T 信息信号通过时钟信号C L K 变换成并行输出的串行/ 并行移位寄存器1 6 1 , 和在按照上述串行/ 并行移位寄存器1 6 1 输出的地址信号而设定的地址中, 使上述的A F T 信息信号按照上述微计算机1 0 输出的允许输入信号M E 作调整而使上述储存的A F T 信息信号按照允许读出信号R E 输出的存储器1 6 2 , 以及将上述存储器1 6 2 输出的A F T 信息信号作临时储存并输出到上述微型计算机1 0 的缓冲存储器1 6 3 等构成的。

这里, 由A F T 信息储存部1 6 的存储器1 6 2 储存并输出的A F T 信息信号由8 位构成。即, 参照图5 , 第7 位根据逻辑状态表示自动或手动存储模式, 第6 位逻辑状态表示从中心频率沿负方向或正方向失调, 第5 至第0 位表示从中心频率失调的频率数的微调数据。

具有这样结构的本发明调谐数据微调装置和其调节方法的特征可参照图3 至图9 在以下作更详细说明。

使用者如操纵遥控信号发射器通过遥控接收部1 1



将频道转换数据输入微型计算机10，或如操作键盘1

2 通过键盘12 将频道转换数据输入微型计算机10，  
则微型计算机10，如图6所示，对频道转换数据的输入进行判断，从AFT信息存储部16 读出相应频道的AFT信息。

即，如通过输出端DO 微型计算机10 将相应频道的地址信号与时钟信号CRL 一起输出给串行/ 并行移位寄存器161，则串行/ 并行移位寄存器161 根据时钟信号CRL 使地址信号移位。地址信号的移位一结束，微型计算机10 就输出允许读出信号RE 使存储器162 允许读出，同时使缓冲存储器163 启动。这时，存储器162 输出储存在与串行/ 并行移位寄存器161 并行输出的地址信号对应的地址内的AFT 信息，输出的AFT 信息经缓冲存储器163 输入到微型计算机10 的输入端DI 中。

这样，使用者所选择的频道的AFT 信息一旦被读出之后，微计算机10 就由AFT 信息的第7 位判断出是自动存储模式还是手动存储模式。其判断结果，在手动存储模式的情况下，则选择由手动存储模式产生的OSD 文字的色彩，控制OSD 文字发生部18 将所选择频道的文字输出给所选择色彩，该OSD 文字发生部18 的输出文字信号通过合成部分19 在彩色显像管20 上显示。

其后，微计算机10 对调谐数据进行计算。

即，在读出的AFT 信息的第6 位上判断频率是朝正(+) 方向还是朝负(-) 方向失调，根据其判断结果的失调方向，从所选择的频道的中心频率数据，对第5 至第0 位的微调数据作加减运算，算出调谐数据，然

后将算出的调谐数据输送至调谐器1 3。

这样，由微计算机1 0 算出的调谐数据如输入给调谐部1 3，则调谐部1 3 就根据调谐数据将广播信号调谐后输出。

调谐部1 3 的输出信号，在中频信号处理部1 4 进行中频处理作为图像信号输出。还有，由该图像信号检出同步信号及A F T 信号并输入给微计算机1 0，因此得知由调谐数据得到的广播信号的调谐结束。由中频信号处理部1 4 输出的图像信号，在图像处理部1 5 中进行图像处理，在合成部1 9 与O S D 文字信号合成后，输出给彩色显像管2 0 并在画面显示出来。

另一方面，在由微计算机1 0 读出的A F T 信息的第7 位的逻辑状态为“0”的自动存储模式的场合，选择由自动存储模式产生的O S D 文字的色彩来显示出频道。就是说，用与上述手动存储模式不同的色彩选择O S D 文字，控制O S D 文字发生部将频道显示在彩色显像管2 0 之后，算出调谐数据并输送至调谐部1 3，由此对广播信号进行调谐。而且，在调谐之后，判断从中频信号处理部1 4 输出的A F T 信号电平。

这时，如果不处在A F T 状态，则改变输出调谐数据之后，判断所输出的调谐数据现在是否处在所选择的频道的界限频率范围之内。

若处在界限频率范围以内时，就进行搜索动作以判断是否满足A F T 状态。在这样状态中，若构成A F T 状态，则控制A F T 信息存储部1 6，在相应地址内存储现在的A F T 信息，因而可以将现在的频道在下次的再调谐时使用。

就是说，A F T 信息的第7 位变成自动存储模式的

逻辑“0”，第6位随着调谐数据从现在频道的中心频率的失调方向变为逻辑“0”或逻辑“1”，第5位至第0位形成微调数据。这样的A F T信息与相应的地址信号从微计算机10的输出端D O输出，在串行/并行移位寄存器161中被移位，一旦移位完成，就输出允许写入信号WE使存储器162允许写入以便使A F T信息存储到相应地址内。

如这样将A F T信息（数据）存储起来之后，如果下次再选择那个频道，就可将存储在图4的相应储存器地址中的A F T信息读出，由于不用如已有那样在第一，第二，第三搜索区域阶段地进行搜索，根据所读出数据立即确定调谐数据如图6的A步骤所实施的那样，从而解决了已有那样的因信号及搜索区域的差异而产生的画面抖动现象。

另一方面，在对如上所述那样选择的频道广播信号进行调谐的状态中，使用者如按下微调增减键17，进行图7所示的微调数据的增减，这如图8那样在画面上表示。在微调增减键不处于输入状态时，应该判断设定键的输入如何，若判断设定键输入，则判断微调数据是否处于如图8所示的状态，储存所表示状态的经调节的微调数据，用以手动存储模式而产生的O S D文字的色彩如图9那样显示出频道。即使不是设定键输入，也不是微调数据的表示状态时，则判断为其它外部键输入状态，立即终止动作。

从以上详细说明看出，本发明将各个频道的A F T信息储存起来，在进行频道选择时，根据上述储存的相应频道的A F T信息输出调谐数据，在广播信号进行调谐时，广播信号的频率即使失调画面也不抖动，可迅速

地对广播信号进行调谐。

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还有，通过使用者的操作可以改变调谐数据，因此，在A F T 信号电平的设定区域失调，或对强电场和弱电场的广播信号进行调谐时，也有对广播信号进行正确的调谐的效果。

# 说明书附图

图1

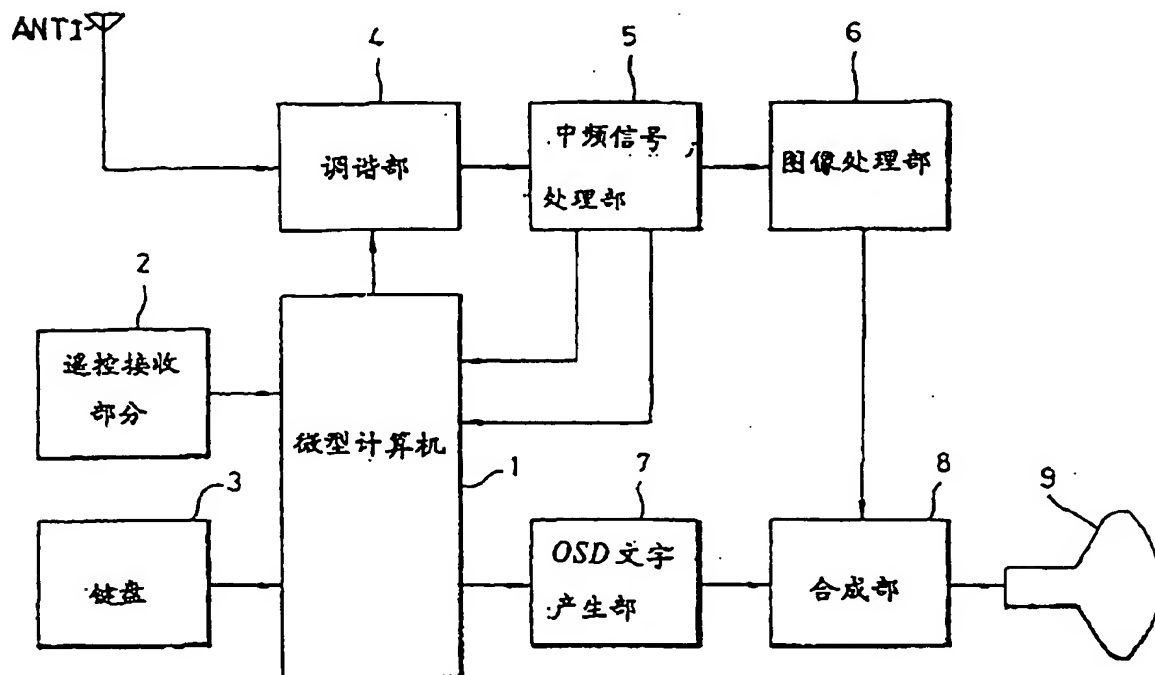


图2

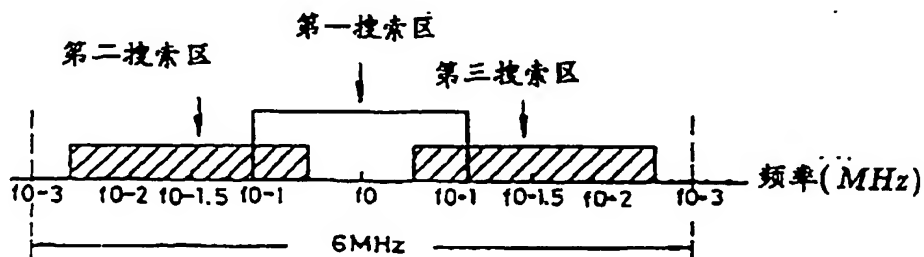


图3

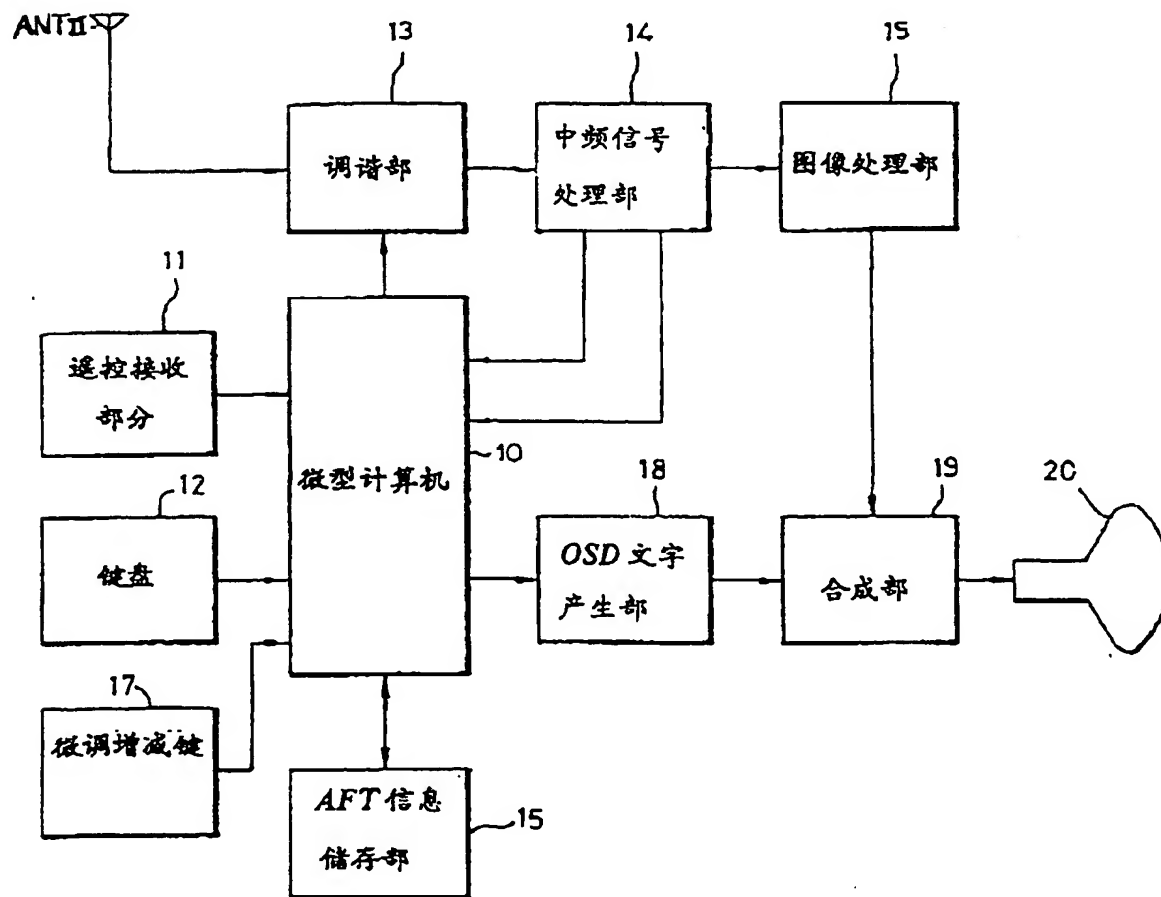


图4

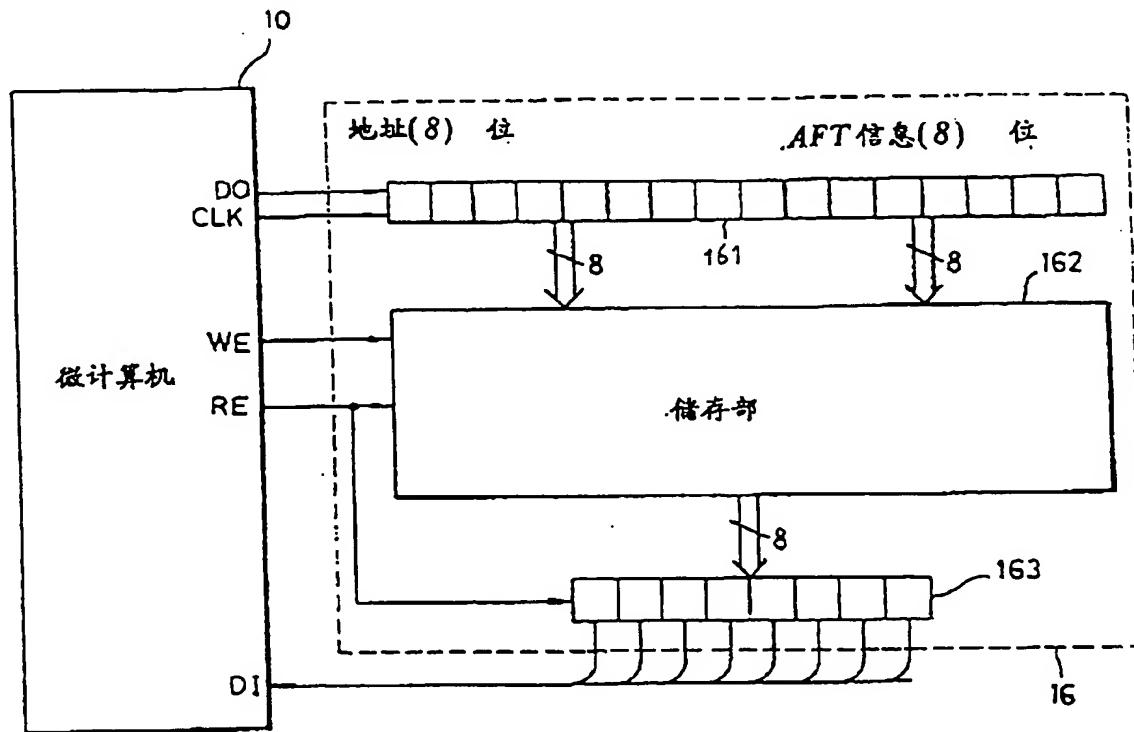


图5

位	逻辑状态	区分
第7位	0	自动储存模式
	1	手动储存模式
第6位	0	朝(-)方向失调
	1	朝(+)方向失调
第5~第0位		所失调频率的微调数据

图6

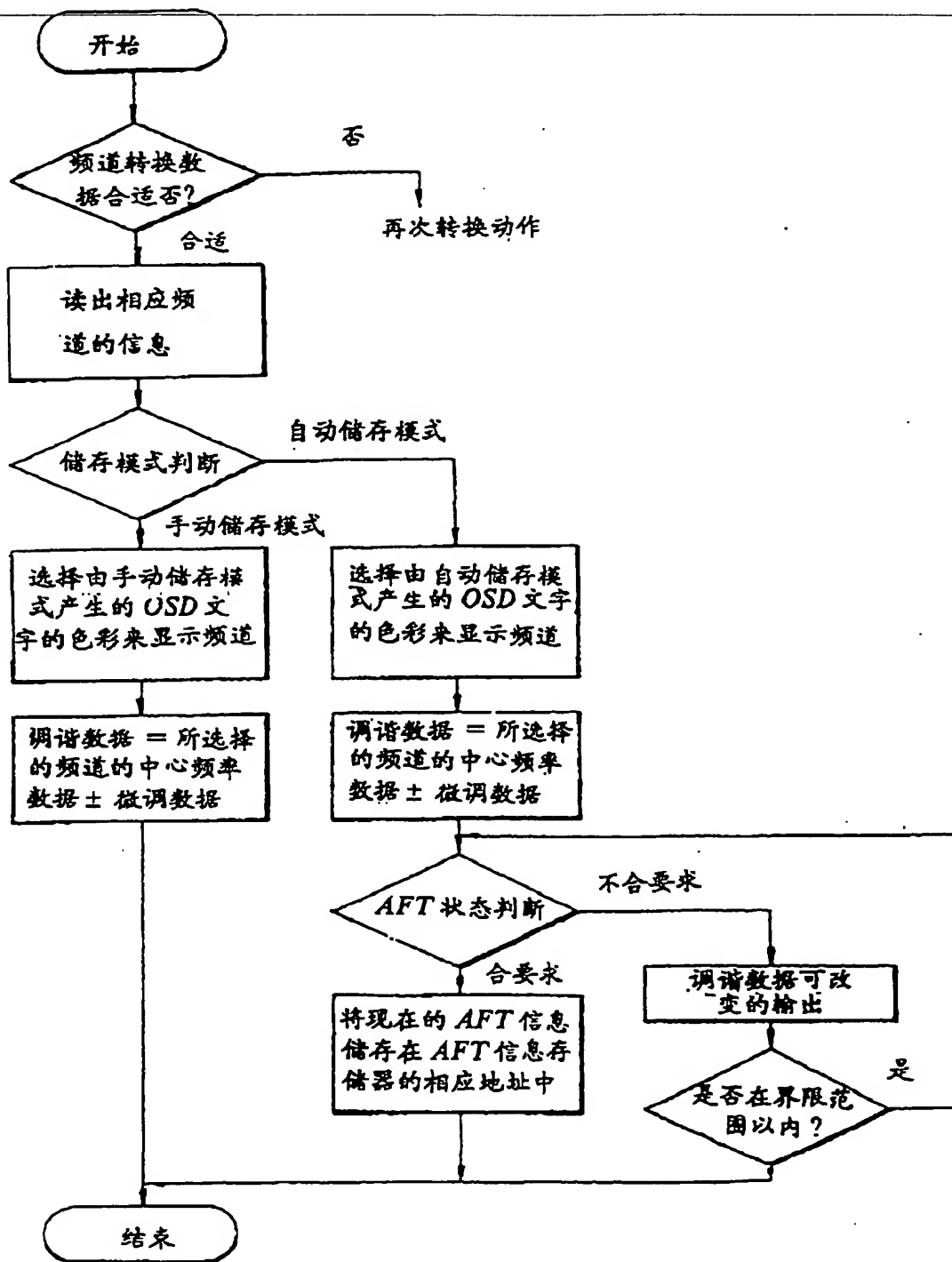




图 7

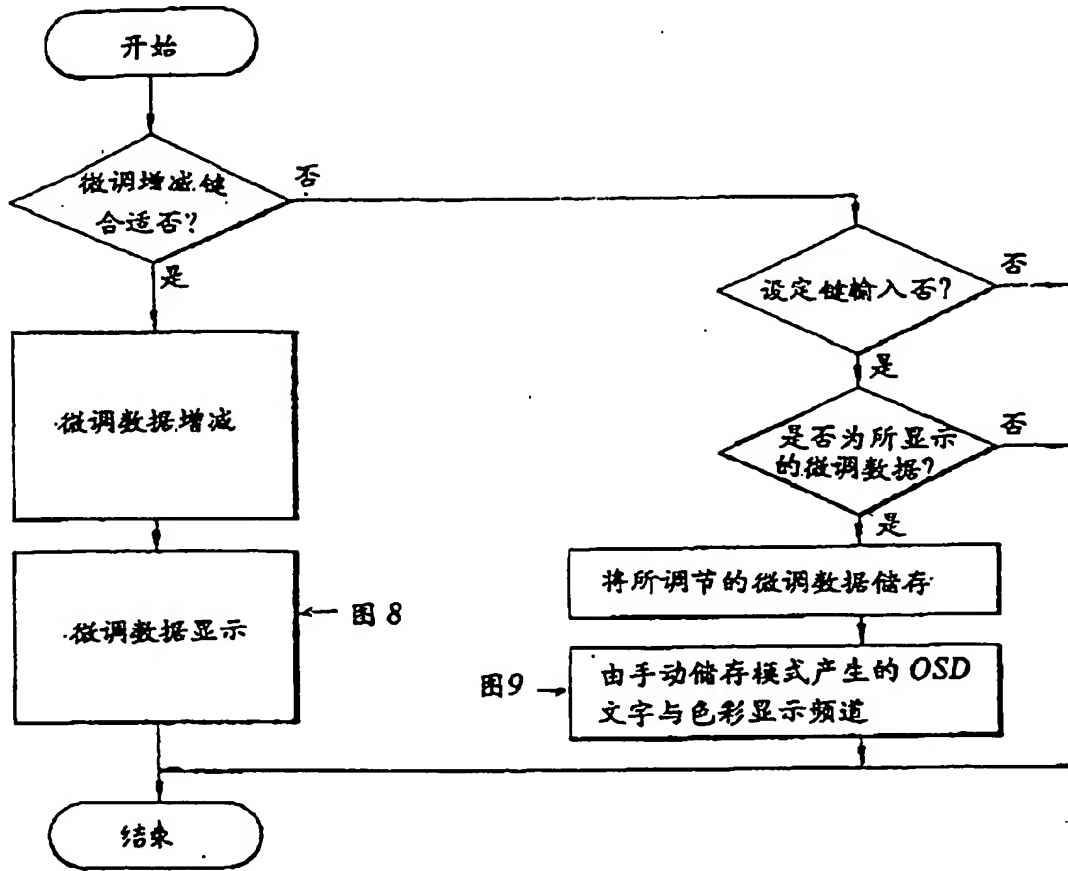


图 8

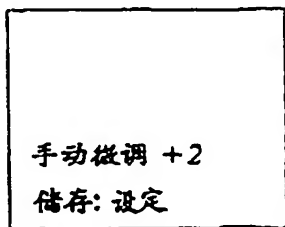
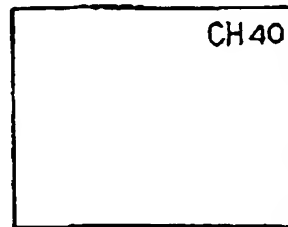


图 9



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